OCR
Oxford Cambridge and RSA

GCE

Biology A

Unit **H020/02:** Depth in biology

Advanced Subsidiary GCE

Mark Scheme for June 2017

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This mark scheme is published as an aid to teachers and students, to indicate the requirements of the examination. It shows the basis on which marks were awarded by examiners. It does not indicate the details of the discussions which took place at an examiners' meeting before marking commenced.

All examiners are instructed that alternative correct answers and unexpected approaches in candidates' scripts must be given marks that fairly reflect the relevant knowledge and skills demonstrated.

Mark schemes should be read in conjunction with the published question papers and the report on the examination.

OCR will not enter into any discussion or correspondence in connection with this mark scheme.

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Annotations

Annotation	Meaning
DO NOT ALLOW	Answers that are not worthy of credit
IGNORE	Statements that are irrelevant
ALLOW	Answers that can be accepted
( )	Words that are not essential to gain credit
__	Underlined words must be present in answer to score a mark
ECF	Error carried forward
AW	Alternative wording
ORA	Or reverse argument

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Marking Annotations

Annotation	Use
BOD	Benefit of Doubt
CON	Contradiction
	Cross
ECF	Error Carried Forward
GM	Given Mark
	Extendable horizontal wavy line (to indicate errors / incorrect science terminology)
I	Ignore
	Large dot (various uses as defined in mark scheme)
	Highlight (various uses as defined in mark scheme)
NBOD	Benefit of the doubt not given
	Tick
^	Omission Mark
BP	Blank Page
L1	Level 1 answer in Level of Response question
L2	Level 2 answer in Level of Response question
L3	Level 3 answer in Level of Response question

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Subject Specific Marking Instructions
INTRODUCTION

Your first task as an Examiner is to become thoroughly familiar with the material on which the examination depends. This material includes:

- the specification, especially the assessment objectives
- the question paper
- the mark scheme.

You should ensure that you have copies of these materials.

You should ensure also that you are familiar with the administrative procedures related to the marking process. These are set out in the OCR booklet
Instructions for Examiners. If you are examining for the first time, please read carefully **Appendix 5 Introduction to Script Marking: Notes for New Examiners**.

Please ask for help or guidance whenever you need it. Your first point of contact is your Team Leader.

Examples of the Level of Response answers are provided as an Appendix at the end of this mark scheme. Please familiarise yourself with them and use them as your guide when marking.

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Question			Answer	Mark	Guidance
1	(a)	(i)	*you can now see* Golgi body / mitochondria / (smooth / rough) endoplasmic reticulum / ER / RER / SER / ribosomes **OR** organelles seen in more detail / grana (in chloroplast) / thylakoids (in chloroplast) / nuclear pore / cristae (in mitochondria) / membranes within organelles / double nuclear membrane / (double) nuclear envelope **OR** resolution is **,** higher / better ✓	**1**	**IGNORE** clarity **IGNORE** ref to size of organelles **DO NOT ACCEPT** chloroplast **IGNORE** ref to ultrastructure unqualified
1	(a)	(ii)	*LSCM image* has lower <u>resolution</u> (than EM) **OR** can have <u>fluorescen</u>t tag **OR** can see movement (as can be used on living cells) **OR** can see **,** different layers / at different depths (of the sample) ✓	**1 max**	**ORA** for electron microscope needs to be comparative **IGNORE** colour **IGNORE** ref to 2D / 3D / depth of field

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Question			Answer	Mark	Guidance
1	(b)	(i)	prophase (1) ✓	1	**DO NOT ACCEPT** prophase II (as question states meiosis I)
1	(b)	(ii)	**1** chromosomes / chromatids , visible / condensed ✓ **2** chromosomes not **,** organised / yet aligned / arranged **OR** chromosomes not at **,** ends / equator ✓ **3** nuclear envelope (around chromosomes) / nuclear membrane is present / chromosomes separated from cytoplasm ✓ **4** no (visible) nucleolus ✓	2 max	**Mark the first 2 answers** **1** Needs to be a clear statement **2 ACCEPT** chromosomes , in different positions / scattered / spread out **3 ACCEPT** nuclear membrane starting to disappear **DO NOT ACCEPT** nuclear membrane has disappeared
1	(b)	(iii)	**1** independent / random **,** <u>assort</u>ment ✓ **2** (homologous chromosomes) line up**,** across the centre of the cell / on the equator / on the metaphase plate ✓ **3** maternal or paternal chromosomes / either one of the homologous pair **,** can end up **,** facing either pole / in either (daughter) cell ✓ **4** each chromosome of the homologous pair **,** is genetically different / contains different alleles / contains different gene variant ✓	3 max	**4 ACCEPT** if described in terms of chromatids being genetically different

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Question			Answer	Mark	Guidance
1	(c)		***2 max for sources*** embryonic / embryo ✓ fetus / fetal ✓ umbilical cord (blood) ✓ (adult) bone marrow (tissue) ✓ convert somatic cell into pluripotent cell ✓	**2 max**	**ACCEPT** e.g. breast milk / muscle / liver / placenta / etc. **ACCEPT** blastocyst
			ethical issue – must relate to one of their stated sources ethical issue identified – such as 1 from the list below ✓	**2**	**Note:** list of issues is not exhaustive – credit a well expressed issue
			embryonic **E1** embryo **,** destroyed / killed / discarded **E2** use of excess embryos from assisted fertilisation (IVF) **or** **or** **E3** debate about when life begins **or** **E4** embryo cannot give consent **or**		
			fetal **F1** obtained from **,** miscarried / aborted **,** fetuses **or** *umbilical cord* **U1** detached from infant at birth anyway		**F1 IGNORE** ref to obtaining fetal stem cells by killing fetus but can still access the judgement mark
			or *bone marrow* **B1** harvesting bone marrow is **,** painful **/** risky **B2** donor babies / **or** babies conceived specifically to provide a bone marrow transplant for a sibling (with a condition requiring the transplant)		
			a statement indicating **,** judgement / opinion / understanding **,** of this ethical		Can only be awarded once the issue relating to one of their sources has been identified.

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			issue ✓		**IGNORE** 'playing God' as an opinion

Question			Answer	Mark	Guidance
2	(a)			2	**IGNORE** any observations
			D1 put **,** (leaf) stalk(s) / petiole(s) **,** in **,** dye / stain / food colouring ✓		**D1 ACCEPT** 'stick' for 'stalk'
			D2 (then) cut **,** transversely / cross section ✓		**D2 ACCEPT** cut across **,** (leaf) stalk / petiole (with a sharp blade) a longitudinal **,** cut / section cut in half **IGNORE** **IGNORE**
			OR		
			M1 cut a (thin) **,** transverse / cross **,** section ✓		**M1 ACCEPT** cut a (thin) slice of (leaf) stalk / petiole (with a sharp blade) a longitudinal **,** cut / section cut in half **IGNORE** **IGNORE**
			M2 (then) add (named) stain / observe with microscope under low power ✓		

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Question			Answer	Mark	Guidance
2	(b)		*lignin* (Water Starwort) has no / less **,** lignin (than deciduous woodland plants) ✓ (Cholla) more lignified (walls) / (walls) contain more lignin (than deciduous woodland plants) ✓ **OR** *thickness of walls* (Water Starwort) has thinner walls (of xylem vessels) (than deciduous woodland plants) ✓ (Cholla) has thicker wall (of xylem vessels) (than deciduous woodland plants) ✓	2	*The comparison is between each of these plants with a woodland deciduous plant and not a comparison between the 2 species*

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<table>
<tr><th colspan="3">Question</th><th>Answer</th><th>Mark</th><th>Guidance</th></tr>
<tr><td>2</td><td>(c)</td><td></td><td>
similarity
both made up of cells joined end to end
or
xylem (vessels) and phloem <u>sieve</u> tube <u>elements</u> both lack , nuclei / contents
or
both are , complex tissues / made up of more than one cell type ✓

differences max 2
<table>
<tr><th></th><th>xylem</th><th>phloem</th><th></th></tr>
<tr><td>1</td><td>lignified / contains lignin</td><td>not lignified / only contain cellulose</td><td>✓</td></tr>
<tr><td>2</td><td>wide lumen</td><td>lumen not wide / lumen small</td><td>✓</td></tr>
<tr><td>3</td><td>no end walls / no sieve plates / continuous tube</td><td>sieve plates</td><td>✓</td></tr>
<tr><td>4</td><td>no companion cells</td><td>companion cells</td><td>✓</td></tr>
<tr><td>5</td><td>vessels</td><td>no vessels</td><td>✓</td></tr>
<tr><td>6</td><td>no sieve tube elements</td><td>sieve tube elements</td><td>✓</td></tr>
<tr><td>7</td><td>(bordered) pits</td><td>no pits</td><td>✓</td></tr>
<tr><td>8</td><td>no cytoplasm / no organelles</td><td>has cytoplasm / has (named) organelles</td><td>✓</td></tr>
</table>
</td><td>1

2 max</td><td>IGNORE ref to function

ACCEPT both are tubes
DO NOT ACCEPT hollow tubes

Only award a mark for a comparative statement
Read through as prose and mark the first 2 differences

IGNORE ref to dead / living</td></tr>
</table>

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Question			Answer	Mark	Guidance
3	(a)		removal of operculum (of fish) / move operculum out of the way / cut open exoskeleton (of insect) ✓ method to , observe / display , gills / tracheae / tracheoles ✓	2	**ACCEPT** any suitable detail of display method e.g. observe structures under water placing a rod/pencil into buccal cavity to display lamellae staining tracheoles with methylene blue
3	(b)	(i)	20 indicated as the incorrect value ✓ 19 ✓	2	e.g. number written alongside the 20 20 circled or indicated by arrow or other indication
3	(b)	(ii)	tracheole(s) ✓	1	

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Question			Answer	Mark	Guidance
3	(b)	(iii)	**1** mammals have just one trachea **and** insects have multiple tracheae ✓ **2** mammals (much) larger diameter / insects (much) smaller diameter ✓ **3** in mammals trachea has **,** cartilage / no chitin (support) **and** in insects tracheae have **,** no cartilage / chitin ✓ **4** mammals have **,** C-shaped 'rings' / incomplete circle **,** **and** insects have spiral (support) ✓ **5** mammal trachea is longer / (individual) insect tracheae shorter ✓ **6** mammal trachea branch into bronchi **and** insect tracheae branch into tracheoles ✓ **7** mammal trachea has **,** smooth muscle / goblet cells / ciliated epithelium **and** (individual) insect tracheae do not ✓	**2**	Statements must be comparative Assume 'it' is the mammal **2 ACCEPT** 'wider / narrower' for 'larger / smaller' diameter **IGNORE** bigger **4 ACCEPT** descriptions e.g. gap v no gap **in** strengthening **6 ACCEPT** 'leads to' instead of 'branch into'

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Question			Answer	Mark	Guidance
3	(c)		For answers marked by levels of response: Read through the whole answer from start to finish, concentrating on features that make it a stronger or weaker answer using the indicative scientific content as guidance. The indicative scientific content indicates the expected parameters for candidates' answers, but be prepared to recognise and credit unexpected approaches where they show relevance. Using a 'best-fit' approach based on the science content of the answer, first decide which set of level descriptors, **Level 1, Level 2 or Level 3, best describes the overall quality** of the answer using the guidelines described in the level descriptors in the mark scheme. Once the level is located, award the higher or lower mark. **The higher mark** should be awarded where the level descriptor has been evidenced and all aspects of the communication statement (in italics) have been met. **The lower mark** should be awarded where the level descriptor has been evidenced but aspects of the communication statement (in italics) are missing. **In summary:** • **The science content determines the level.** • **The communication statement determines the mark within a level.** **Level 3 (5–6 marks)** Detail of more than one adaptation of the alveoli	6	**For Level 3** **need more than one correct adaptations of alveoli AND** **an explanation of how more than one adaptation of alveoli improves efficient gaseous exchange.** **IGNORE** simply stating that the adaptation increases efficiency **IGNORE** further ref to capillaries beyond vascularisation **Indicative scientific points may include the following:** **A – area** *Adaptation -* • large surface (in small volume) *detail* - large numbers of (spherical) alveoli • surfactant *detail -* • reduces , cohesive action between water molecules / surface tension • prevents alveoli from collapsing • elastic fibres *detail -* • stretch and recoil • stretch increases surface area • recoil helps force air out *Explanation -* • more space for molecules to pass

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			AND scientific explanations of how more than one adaptation improves the efficiency of gas exchange. *There is a well-developed line of reasoning which is clear and logically structured. The information presented is relevant*. **Level 2 (3–4 marks)** Identification of more than one adaptation of the alveoli **AND** scientific explanation of how one adaptation improves the efficiency of gas exchange. *There is a line of reasoning presented with some structure. The information presented is in the most-part relevant.* **Level 1 (1–2 marks)** Identification of one adaptation of the alveoli **OR** scientific explanation of how the efficiency of gas exchange is improved. *There is an attempt at a logical structure with a line of reasoning. The information is in the most part relevant.* **0 marks** No response or no response worthy of credit.		• large volume of gas exchanged per unit time / high rate of diffusion **D – distance** *Adaptation -* • thin walls *detail -* •alveolar wall one cell thick •(alveolar wall) made of squamous epithelium •(which consist of) flattened cells •capillaries close to alveolar wall *Explanation -* • short diffusion path / short distance for diffusion • high rate of diffusion **G – gradient** *Adaptation -* • ventilated *detail -* •oxygen constantly replenished •carbon dioxide constantly removed • good blood supply / well vascularised *detail -* •capillaries close to alveolar wall •blood supply constantly replenished • elastic fibres (detail) •stretch and recoil •stretch increases surface area •recoil helps force air out

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					Explanation - • maintains **,** concentration / diffusion **,** gradients • (keeps) O_2 higher in alveolar air than blood (from pulmonary artery) • (keeps) CO_2 lower in alveolar air than blood (from pulmonary artery) **T – temperature** *Adaptation -* • internal gas exchange surface *Explanation -* • warm / higher / constant temperature **,** so rate of diffusion stays high

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<table>
<tr><th colspan="3">Question</th><th>Answer</th><th>Mark</th><th>Guidance</th></tr>
<tr><td>4</td><td>(a)</td><td></td><td>
<table>
<tr><th>Statement</th><th>B lymphocytes</th><th>T lymphocytes</th></tr>
<tr><td>Matured in bone marrow</td><td>✓</td><td>×</td></tr>
<tr><td>Form part of immune response</td><td>✓</td><td>✓</td></tr>
<tr><td>Differentiate into memory cells</td><td>✓</td><td>✓</td></tr>
<tr><td>Produce chemicals that can cause lysis of infected cells</td><td>×</td><td>✓</td></tr>
<tr><td>Form plasma cell clones</td><td>✓</td><td>×</td></tr>
</table>
✓ ✓ ✓ ✓</td><td>4</td><td>
1 mark for each correct row
Ticks and crosses must be clear –
do not accept ‘hybrids’
If ALL CELLS BLANK then = NR
If TICKS AND BLANKS ONLY in the table, 1 mark for each correct row as follows:
<table>
<tr><th>B lymphocytes</th><th>T lymphocytes</th></tr>
<tr><td>✓</td><td>×</td></tr>
<tr><td>✓</td><td>✓</td></tr>
<tr><td>✓</td><td>✓</td></tr>
<tr><td></td><td>✓</td></tr>
<tr><td>✓</td><td></td></tr>
</table>
✓ ✓ ✓ ✓
If CROSSES AND BLANKS ONLY in the table, 1 mark for each correct row as follows:
<table>
<tr><th>B lymphocytes</th><th>T lymphocytes</th></tr>
<tr><td>✓</td><td>×</td></tr>
<tr><td></td><td></td></tr>
<tr><td></td><td></td></tr>
<tr><td>×</td><td></td></tr>
<tr><td></td><td>×</td></tr>
</table>
✓ ✓ ✓ ✓
ACCEPT ‘yes’ for ‘tick’ and ‘no’ for ‘cross’
</td></tr>
</table>

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Question			Answer	Mark	Guidance
4	(b)		**L** primary **,** (just) after vaccination / when the person is vaccinated **and** secondary **,** (just) after infection / when the person is infected ✓ *primary* **P** slow(er) / delayed **,** response because of **,** clonal selection / clonal expansion / production of antibodies ✓ *secondary* **S** quick(er) response / shorter lag time / more antibodies produced **,** because of **,** memory cells / immunological memory ✓	3	**L Comments should relate to Fig 4 (rather than straight recall)** **IF THIS MARK NOT STATED, look on the graph** from appropriate labels on the graph **ACCEPT** a description of the shape of the graph in both responses **P ACCEPT** description

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Question			Answer	Mark	Guidance
4	(c)		For answers marked by levels of response: Read through the whole answer from start to finish, concentrating on features that make it a stronger or weaker answer using the indicative scientific content as guidance. The indicative scientific content indicates the expected parameters for candidates' answers, but be prepared to recognise and credit unexpected approaches where they show relevance. Using a 'best-fit' approach based on the science content of the answer, first decide which set of level descriptors, **Level 1, Level 2 or Level 3, best describes the overall quality** of the answer using the guidelines described in the level descriptors in the mark scheme. Once the level is located, award the higher or lower mark. **The higher mark** should be awarded where the level descriptor has been evidenced and all aspects of the communication statement (in italics) have been met. **The lower mark** should be awarded where the level descriptor has been evidenced but aspects of the communication statement (in italics) are missing. **In summary:** • **The science content determines the level.** • **The communication statement determines the mark within a level.**	**6**	**For Level 3** **need discussion of more than one correct factor related to information in rubric of question** **AND** **a plausible suggestion of an action that could be taken to address one of these factors.** **IGNORE** climate change (as not mentioned in information given) **IGNORE** repetition of bullet points and suggestions that are simply reverse action (e.g. don't live close together). **Indicative scientific points may include:** **F1** • *Factor and discussion:* lack of trained health professionals **so** lack of **,** vaccination / treatment lack of understanding of the way in which pathogen is **,** spread / transmission • *Possible action:* increase trained health staff by sending trained health professionals into the area better access to **,** hospitals / clinics train up more health professionals locally educate the population (esp children) so that they can take necessary precautions educate the population about the risk of sexual transmission

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			Level 3 (5–6 marks) Scientific discussion expanding on that given in the bullet point on page 12 of the exam paper of more than one correct factor that affect the spread of communicable diseases in humans **and** a plausible suggestion of an action that could be taken to address one of these factors. *There is a well-developed line of reasoning which is clear and logically structured. The information presented is relevant and substantiated*. **Level 2 (3–4 marks)** Scientific discussion expanding on that given in the bullet point on page 12 of the exam paper of one correct factor that affects the spread of communicable diseases in humans a plausible suggestion of an action that could be taken to address any factor mentioned in the passage. **and** **OR** scientific discussion expanding on that given in the bullet point on page 12 of the exam paper of more than one factor that affects the spread of communicable diseases in humans **OR** plausible suggestions of more than one action that could be put in place to address factor(s) mentioned in the passage. *There is a line of reasoning presented with some structure. The information presented is in the most-part relevant and supported by some evidence.*		**F2** • *Factor and discussion:* the ill cared for by family members **so** family exposed to the pathogen as lack of safe nursing techniques e.g. use of protective clothing / surgical gloves / hand washing / isolation pathogens can be spread more easily **,** by droplet (infection) / coughing / sneezing • *Possible action:* restrict care to trained health professionals better access to **,** hospitals / clinics training in barrier nursing techniques provide isolation wards / quarantine **F3** • *Factor and discussion:* overcrowded living conditions / living in close proximity **so** pathogens can be spread more easily **,** by droplet (infection) / coughing / sneezing / within the community • *Possible action*: accommodation with **,** larger / less sharing of **,** rooms improve ventilation **F4** • *Factor and discussion:*

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			Level 1 (1–2 marks) Limited scientific detail of a factor expanding on that given in the bullet points on page 12 of the exam paper **or** a plausible suggestion of an action that could be put in place to address a factor mentioned in the passage. *There is an attempt at a logical structure with a line of reasoning. The information is in the most part relevant.* **Level 0** No response or no response worthy of credit.		poor disposal of waste / poor sanitation **so** easy to pick up pathogen from **,** faeces / lack of hand washing • *Possible action:* make people aware by **,** putting up public warnings / education projects improve / proper **,** sewage disposal use of (antibacterial) handwashing gels **F5** • *Factor and discussion:* people can **,** travel from / flee **,** places with disease **so** pathogens spread to wider area / spread due to symptomless carriers / epidemic becoming pandemic cannot be reached for **,** vaccination / treatment • *Possible action:* travel ban restrict travel **,** into / out of **,** infected areas health checks at **,** airports / bus stations / train stations quarantine involve **,** army / police **,** to prevent people travelling **F6** • *Factor and discussion:* mourning and burial practices difficult to change deep-seated **,** **so**

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					traditions / religious practices brings people into close contact with pathogen as spread by touch and bodily fluids • *Possible action:* suitable alternative (e.g. cremation) involve local leaders in promoting change in practice

Question			Answer	Mark	Guidance
5	(a)	(i)	28 (%) ✓ ✓	2	**Correct answer = 2 marks** (indicated by 2 ticks) even if no working shown **IGNORE** minus sign **ALLOW 1 mark only** for correct but unrounded answer (e.g. 28.18) **or** for incorrect answer **either** (110 – 79) ÷ 110 **or** 31 ÷ 110 **or** 100 – 71.81 **or** for 27(%) (as 80 was used instead of 79 but method correct) **or** for 29(%) (as 78 was used instead of 79 but method correct)

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Question			Answer	Mark	Guidance
5	(a)	(ii)	**1** number in farmland stays higher than in woodland ✓ **2** number of butterflies in woodland **,** has a greater decrease / drops faster / falls more steeply **,** (than those on farmland) **or** number of butterflies on farmland **,** has a smaller decrease / drops slower / falls less steeply **,** (than those in woodland) ✓ **3** from 2004 to 2012 they both fall by **,** similar / same **,** rate **or** by 6 (per km^2) ✓ **4** woodland population (decreases) **,** from 98 to 48 (per km^2) / by 50 (per km^2) / by 51% **and** farmland population **,** from 110 to 79 (per km^2) / by 31 (per km^2) / by 28% **or** difference of 12 (per km^2) in 1992 **and** difference of 31 (per km^2) in 2012 **or** 23% more decrease in woodland / woodland decreased by 19 (per km^2) more than farmland ✓	**2 max**	Must be comparative statements **2** must be stated and not implied from figs **4 ecf** for 27% / 29% (if that is candidate's answer to **(a)(i)**)

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Question			Answer	Mark	Guidance
5	(a)	(iii)	*woodland population dropped more because of* new / more **,** predator(s) / parasite(s) / disease(s) (of butterflies) **or** more interspecific competition / new species competing for food **or** (lack of management / woodland became over grown / reduction in open spaces **,** leading to) loss of **,** habitat / food supply / breeding sites ✓ *farmland decreased less because* leave **,** wildlife refuges / area to grow wild **or** conserve hedgerows **or** fewer **,** predators / parasite(s) / disease(s) (of butterflies) **or** (more open spaces) for breeding sites ✓	**1 max**	Must specify which population is being discussed. **DO NOT ACCEPT** in the context of deforestation
5	(a)	(iv)	*lacks validity because* **1** weather conditions only apply to 2012 ✓ **2** numbers were falling before 2012 ✓ **3** weather conditions and butterfly decline may not be linked / other factors may be responsible ✓ **4** not enough / no / need more **,** data / evidence (to know that it is the cause of decline) ✓	**2**	**IGNORE** statements relating to being valid **1 ACCEPT** we only know that it was cold and wet in 2012 **4 ACCEPT** we need more information about weather

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			5 weather conditions in North of England not representative of the whole country ✓		**5 ACCEPT** we only know about the weather in Northern England

Question			Answer	Mark	Guidance
5	**(a)**	**(v)**	(same) time of year / time of day / time between sampling **or** (same) size of sample area / length of transect / number of transects **or** (same) capture / counting / sampling **,** technique **or** (exactly the same) place in each habitat ✓	**1**	**Mark the first variable.** **IGNORE** 'time' unqualified

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Question			Answer	Mark	Guidance
5	(b)		*woodlands have a greater species richness because* greater number of butterfly species are in decline (than on farmland) ✓ (so probably) greater number of species were present (originally) ✓ more **,** niches / types of food available / variety of (food) plants ✓ less (or no) pesticide use in woodland / pesticide use in farmland ✓ farmland likely to , be a monoculture / grow limited number of plant species ✓ monoculture results in fewer **,** niches / variety of food plants ✓ **OR** *farmland have a greater species richness because* lost fewer butterfly species ✓ (so) probably larger number of species remain ✓ have conservation areas / conserve hedgerows / leave wildlife refuges / leave areas to grow wild ✓ (so) more **,** niches / variety of (food) plants ✓ *general point* butterflies are an **,** indicator species / indicator of what is happening (to other species in the habitat) ✓	**2 max**	

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Question			Answer	Mark	Guidance
5	(c)	(i)	genetic (biodiversity) ✓	1	
5	(c)	(ii)	allows for adaptation to changing environment ✓ provides variation for natural selection ✓ can offer , camouflage / protection from predators ✓	1 max	**ACCEPT** in the context of an example e.g. species survival when , a / new , disease introduced

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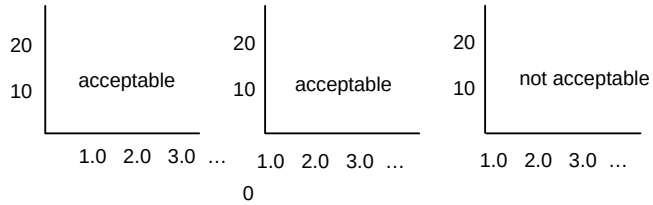
Question			Answer	Mark	Guidance
6	(a)	(i)	**1** appropriate scale chosen **and** x axis labelled glucose concentration (mmol dm^{-3}) **and** y axis labelled mean % absorbance ✓ **2** points plotted correctly ✓ **3** straight line of best fit drawn on graph (not extending beyond the plot points) ✓	3	**1 IGNORE** presence or absence of 0 at origin(s) unless either axis is deemed to have started above 0  **2** x axis glucose concentration (mmol dm^{-3}): 1.0, 2.0, 3.0, 4.0, 5.0, 6.0 y axis mean % absorbance: 67, 54, 47, 41, 26, 16 Centre of cross or dot within + or – half a small square one error in the plotted points **ALLOW** Points for glucose concs 1, 3, 5 & 6 mmol dm^{-3} should be in a straight line. Points for glucose concs 2, 3 & 4 mmol dm^{-3} should be in a straight line with a shallower gradient **Note:** A bar chart will only be able to access mp 2

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Question			Answer	Mark	Guidance
6	(a)	(ii)	find the absorbance (of the juice using the colorimeter) ✓ (from the graph) find the concentration that corresponds to this absorbance ✓ follow the **,** absorbance value / value on y axis **,** across to **,** line of best fit / (calibration) curve **,** and then down to the **,** concentration / x axis ✓	**2 max**	**ACCEPT** vertical and horizontal for x and y

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Question			Answer	Mark	Guidance
6	(b)	(i)	**1** taste the fruit juices to see how sweet they are ✓ **2** place a sample of each fruit juice in a biosensor **and** take the reading **or** test each fruit juice with **,** Benedict's / diastix / clinistix / (diagnostic) test strip **and** observe colour(s) ✓ **3** obtain rank order for **,** sweetness / fruit juice glucose concentration ✓ **4** compare rank orders (of fruit juices) for sweetness and glucose concentration ✓ **5** how a variable was controlled during **,** taste / glucose concentration **,** test ✓	**4 max**	**1** could be in the context of different juices **or** a series of dilutions of the same juice (to give different glucose concentrations) **or** a series of glucose concentrations **2 ACCEPT** semi-quantitative test for reducing sugar Benedict's tests on each fruit juice **and** weigh mass of precipitate formed for each juice perform **ACCEPT** plausible way of determining glucose concentration e.g. relative density / specific gravity / mass change as a result of osmosis Benedict's – blue to red with increasing concentration diastix – green/blue to red clinistix – green/blue to red **or** pink to (dark) purple **4 ACCEPT** the use of a statistical test if rank orders for both are numerical **5** e.g. use same **,** number of drops / volumes **,** of fruit juice cleanse palate between juices blind taste test / stated way to avoid bias tasted by a number of subjects (and results pooled) keep test strip in sample for same length of time add excess Benedict's heat for same length of time / at the same temperature (Benedict's only) filter precipitate in same way (semi-quantitative Benedict's only)

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Question			Answer	Mark	Guidance
6	(b)	(ii)	tasting is **,** subjective / (only) qualitative / not quantitative **or** hard to quantify sweetness **or** people may have different **,** judgement / opinion / taste buds ✓ colour judgement (in Benedict's) is subjective ✓ (juice) may contain **,** sucrose / fructose / other (named) sugar / (artificial) sweetener ✓	1 max	**IGNORE** accuracy / reliability **ACCEPT** ref to biased opinion **ACCEPT** sensible ref to acidity in juice masking sweetness **IGNORE** ref to 'other ingredients' unqualified
6	(c)	(i)	*both* contain **,** C / carbon (atoms) **and** H / hydrogen (atoms) ✓ contain **,** O / oxygen (atoms) ✓ have **,** OH / hydroxyl / hydroxide (groups) ✓	2	**Mark the first 2 answers** **IGNORE** properties e.g. solubility **IGNORE** ref to hexagons / rings **IGNORE** hydrocarbon **DO NOT ACCEPT** hexose **DO NOT ACCEPT** ions **DO NOT ACCEPT** molecules / groups **DO NOT ACCEPT** molecules / groups **ACCEPT** alcohol group **DO NOT ACCEPT** molecules
6	(c)	(ii)	(glucose is) soluble (in water) ✓	1	**ACCEPT** polar / dissolves (in water)
			Total	70	

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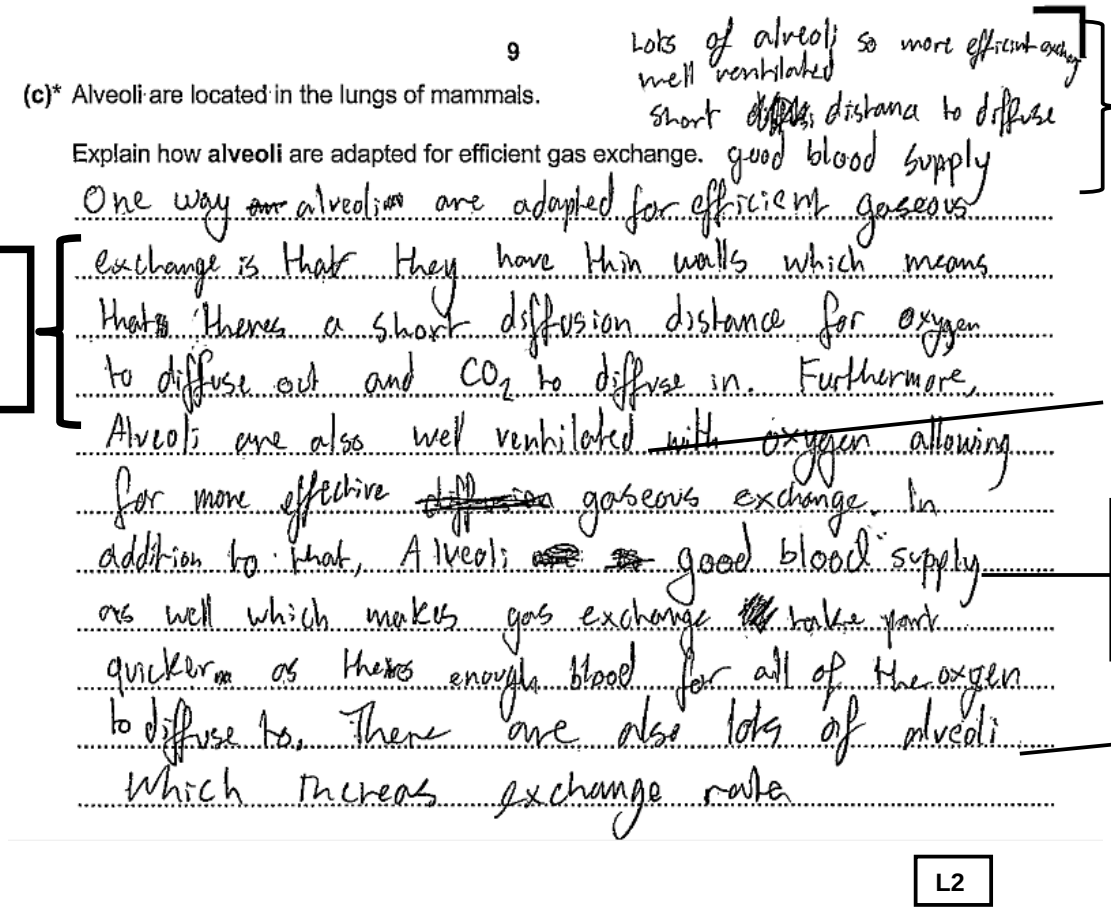
Appendix

Level of Response Exemplars

Question 3(c) Explain how **alveoli** are adapted for efficient gas exchange.

e.g. 1
Level 2

~~with mark for com~~munication = 4 marks



brief notes seen – to be considered if points not made in main answer

D – adaptation and explanation

G – adaptation but no explanation

G – adaptation but no explanation

A – detail of adaptation

More than one category of adaptation identified
One adaptation has with additional detail.
One explanation given and we know which adaptation it refers to.
So only accesses L2 as we need more than one explanation
L3.

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e.g. 2

Level 1 with mark for communication = 2 marks

Explain how **alveoli** are adapted for efficient gas exchange.

The alveoli have a moist surface and constant blood supply for gas exchange. They have a short diffusion pathway to traverse/into allow gases to diffuse into the blood stream. This Theres a constant diffusion gradient as O_2 and CO_2 diffuse in and out. ✓✓ They also have a constant oxygen supply for diffusion gas exchange to take place. Have a large surface area for maximum gas uptake.

[6]

L1

A – adaptation

Explanations not clearly in the context of an adaptation. Adaptation stated but no extra detail.
So only accesses L1.

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e.g. 3

Level 2 with mark for communication = 4 marks

D – detail of adaptation & explanation

A – adaptation

G – adaptation & explanation

Explain how **alveoli** are adapted for efficient gas exchange.

The walls of the alveoli are only one layer of flattened epithelial cells, so a short diffusion distance for oxygen and carbon dioxide to get to the blood is created. They also have a large surface area to volume ratio, so there is a large area on which diffusion can occur, and a short diffusion distance is also created. The alveoli are highly vascularised, so they have access to a ~~good~~ constant blood supply. This maintains the concentration gradient for diffusion, and creates a short diffusion distance as the blood vessels are next to the alveoli. Due to these factors, the rate of diffusion of oxygen and carbon dioxide into and out of the alveoli is very fast, so gas exchange is efficient. [6]

① thin walls ∴ short diff. dist.
② large SA:V ∴ large area for diff. and
③ highly vascularised ∴ maintains conc. gradient (good blood supply) +

Three adaptations identified, one with extra detail. Explanation supplied for only one adaptation so science only gives it a L2.

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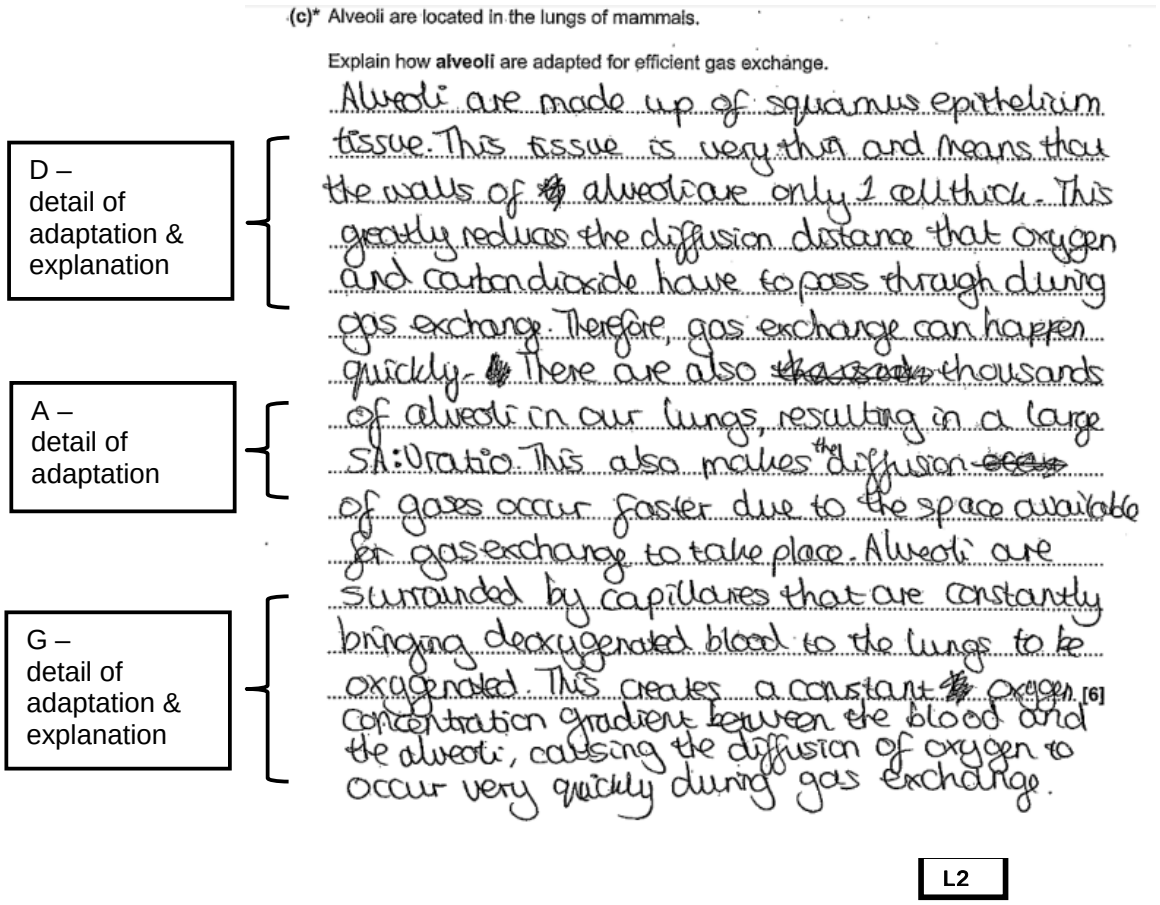
e.g. 4
Level 3 with communication statement = 6 marks



(c)* Alveoli are located in the lungs of mammals.

Explain how **alveoli** are adapted for efficient gas exchange.

Alveoli are made up of squamous epithelium tissue. This tissue is very thin and means that the walls of the alveoli are only 1 cell thick. This greatly reduces the diffusion distance that oxygen and carbon dioxide have to pass through during gas exchange. Therefore, gas exchange can happen quickly. There are also thousands of alveoli in our lungs, resulting in a large SA:V ratio. This also makes the diffusion of gases occur faster due to the space available for gas exchange to take place. Alveoli are surrounded by capillaries that are constantly bringing deoxygenated blood to the lungs to be oxygenated. This creates a constant oxygen concentration gradient between the blood and the alveoli, causing the diffusion of oxygen to occur very quickly during gas exchange. [6]

L2

D – detail of adaptation & explanation

A – detail of adaptation

G – detail of adaptation & explanation

Three adaptations identified, two with extra detail. Explanation supplied for two adaptations. So can access L3.

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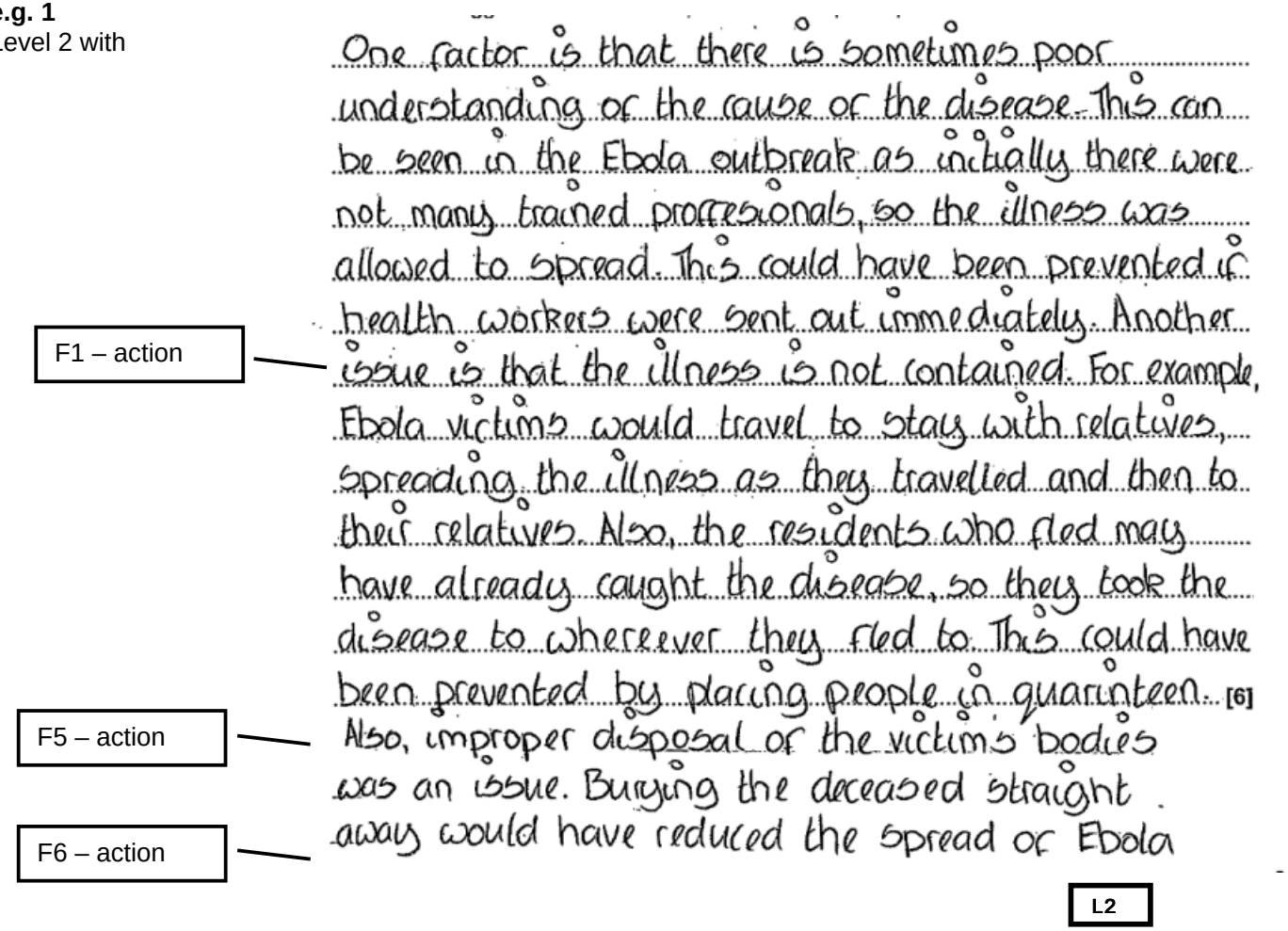
Question 4(c) A number of common factors affect the spread of communicable diseases in humans and some of them are relevant to the spread of Ebola.

From the information above, discuss these factors and suggest what actions could have been put in place to address them.

e.g. 1
Level 2 with communication mark = 4 marks



Three plausible actions identified.
No discussion expanding any of the factors in the bullet points.
So can access L2 only.

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e.g. 2
Level 0 = 0 marks

A lack of hygiene (poor hygiene) increases the likely hood of a spread of disease. Appropriate training should be taken to deal with viral diseases and the training should be offered so that in many countries prone to disease. living in close proximity makes the disease spread from person to person a lot quicker. So houses should be build with enough proximity. Also untrained individuals should not deal with the deceased body of person who had a disease as they can still catch the disease. [6]

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No plausible actions identified.
No discussion expanding any of the factors in the bullet points.
So cannot access L1.

X

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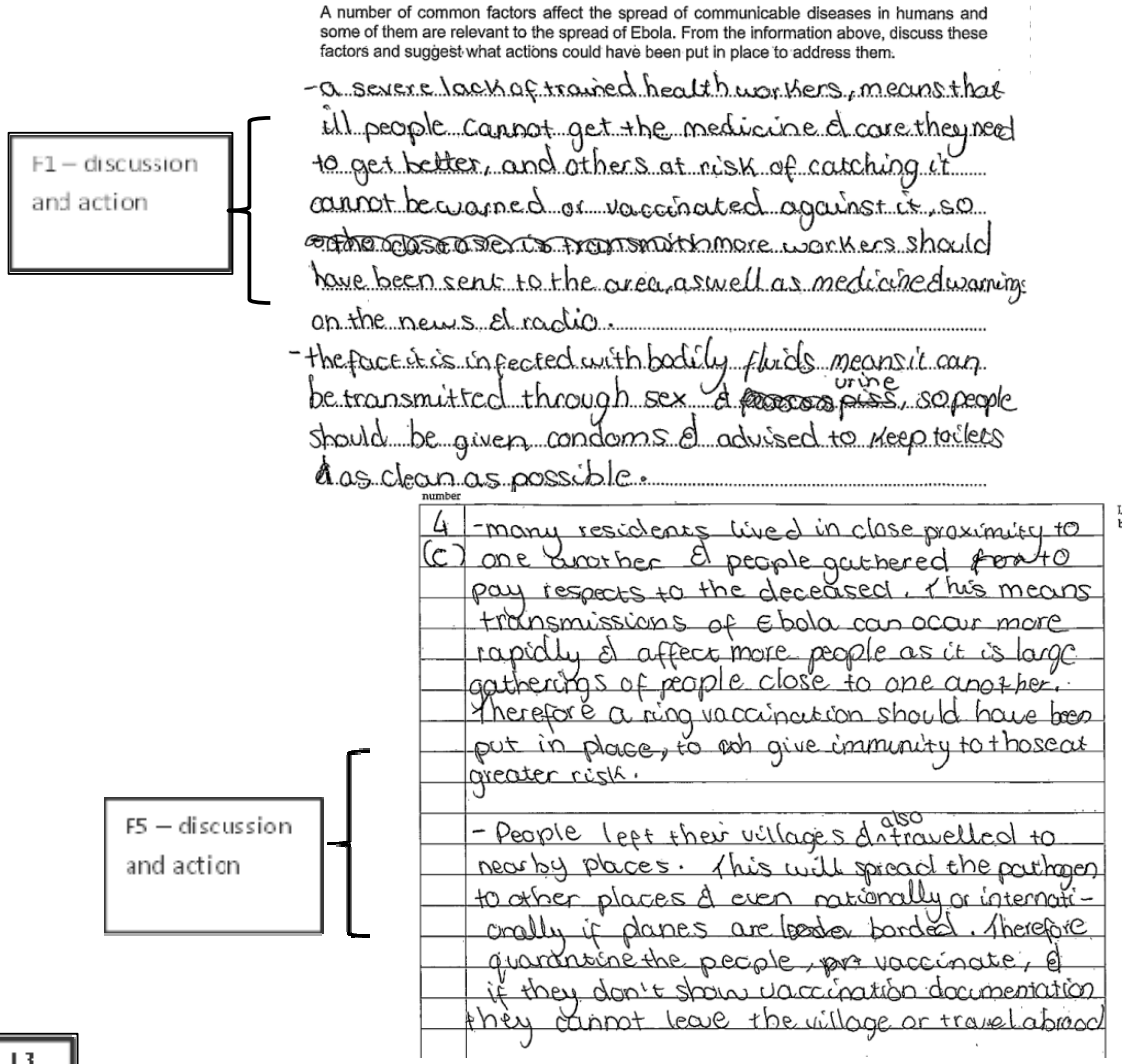
e.g. 3

Level 3 with communication mark = 6 marks



A number of common factors affect the spread of communicable diseases in humans and some of them are relevant to the spread of Ebola. From the information above, discuss these factors and suggest what actions could have been put in place to address them.

F1 – discussion and action

- a severe lack of trained health workers, means that ill people cannot get the medicine & care they need to get better, and others at risk of catching it cannot be warned or vaccinated against it, so the disease is transmitted more. workers should have been sent to the area, aswell as medicine & warning on the news & radio.
- the fact it is infected with bodily fluids means it can be transmitted through sex & ~~poo~~ urine piss, so people should be given condoms & advised to keep toilets & as clean as possible.

F5 – discussion and action

number

4 (c) - many residents lived in close proximity to one another & people gathered ~~for~~ to pay respects to the deceased. This means transmissions of Ebola can occur more rapidly & affect more people as it is large gatherings of people close to one another. Therefore a ring vaccination should have been put in place, to ~~sh~~ give immunity to those at greater risk.

- People left their villages & also travelled to nearby places. This will spread the pathogen to other places & even nationally or internationally if planes are ~~bo~~ bordered. Therefore quarantine the people, ~~pr~~ vaccinate, & if they don't show vaccination documentation they cannot leave the village or travel abroad

L3

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